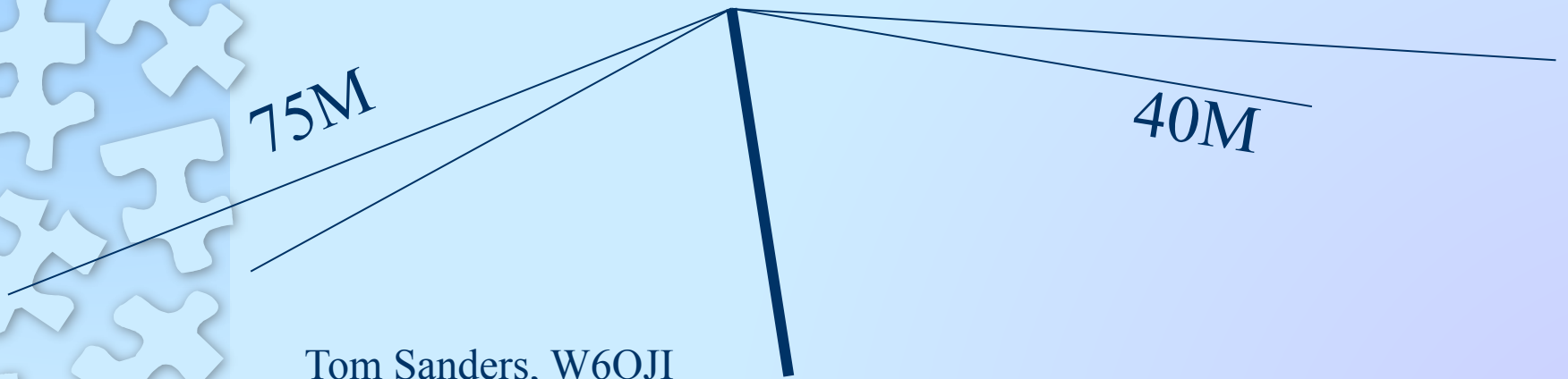


Space Challenged NVIS Antenna

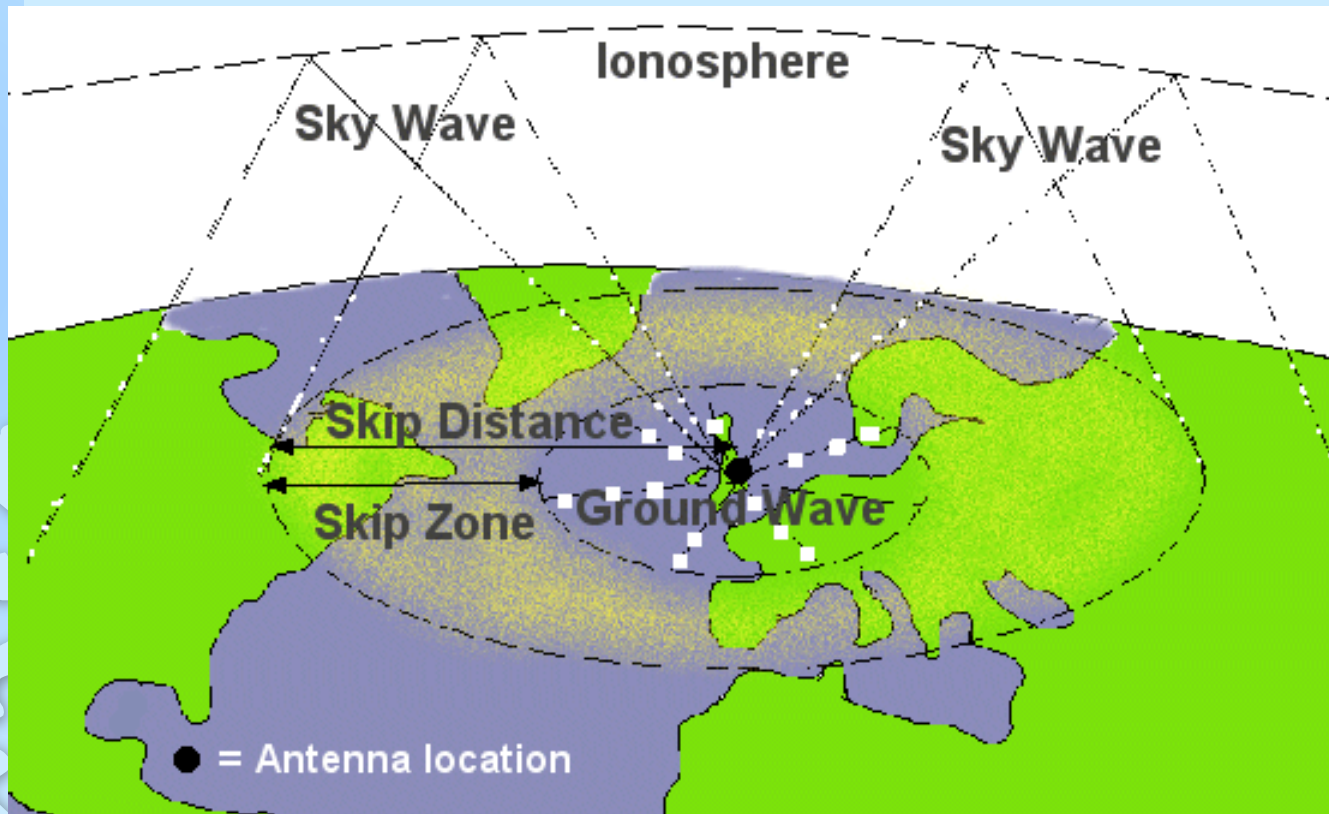


Tom Sanders, W6QJI
Ed Bruette, N7NVP

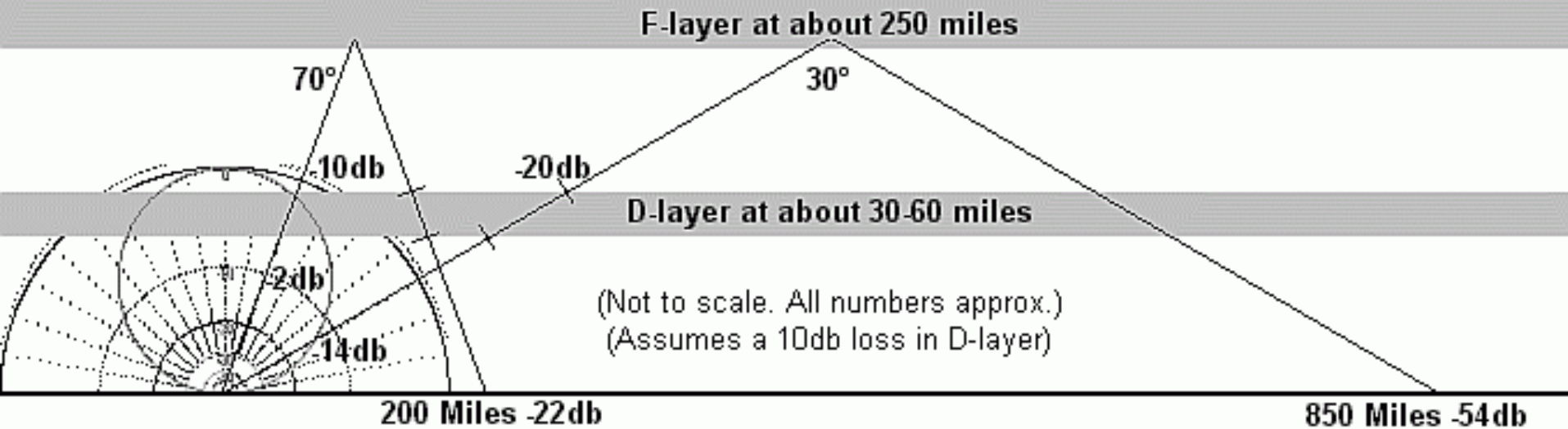
What is NVIS?

- Near
 - Vertical
 - Incident
 - Skywave
- Cloud Warmer

Propagation Theory

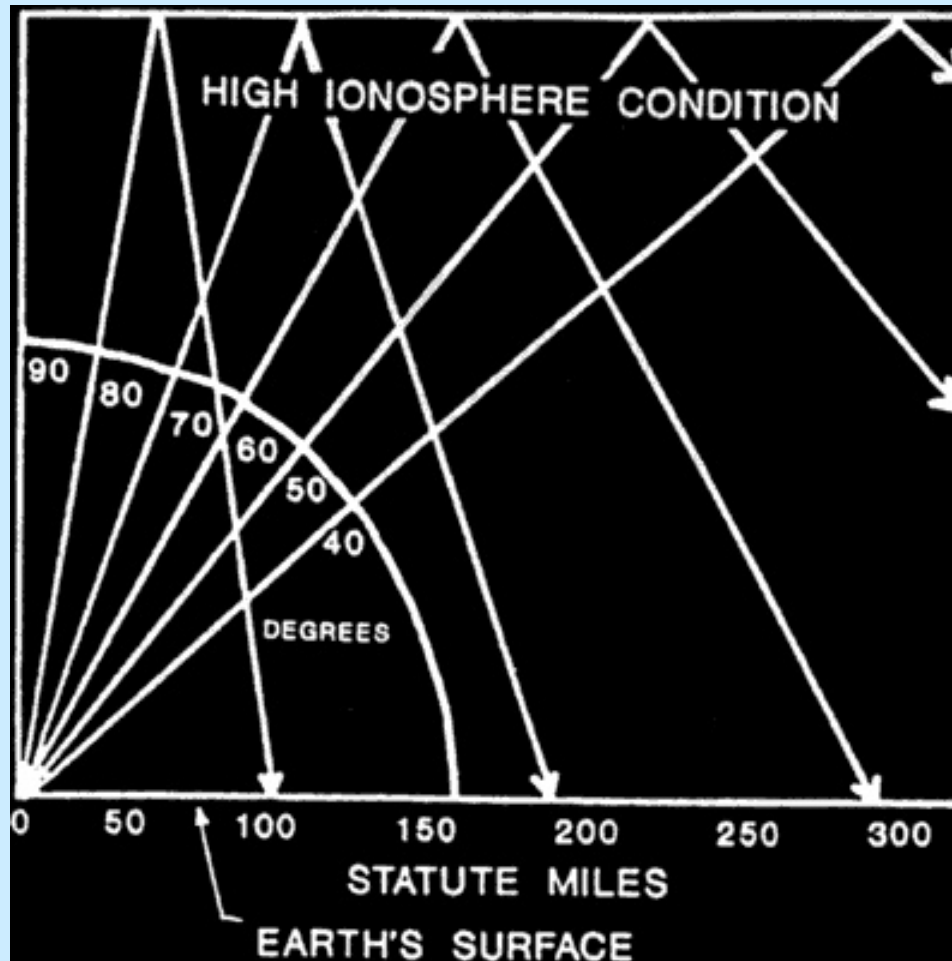


Propagation Theory

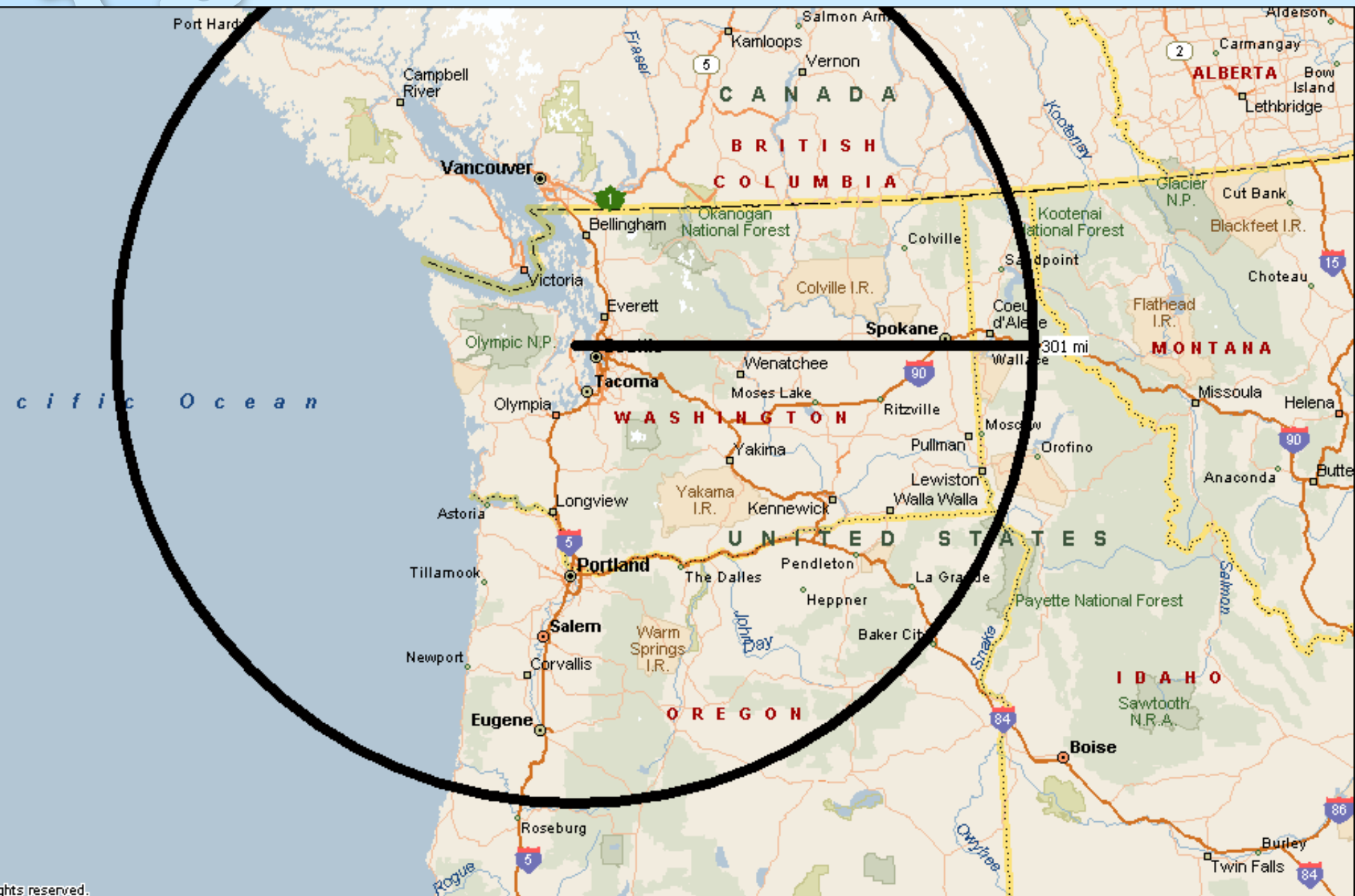




NVIS Effect

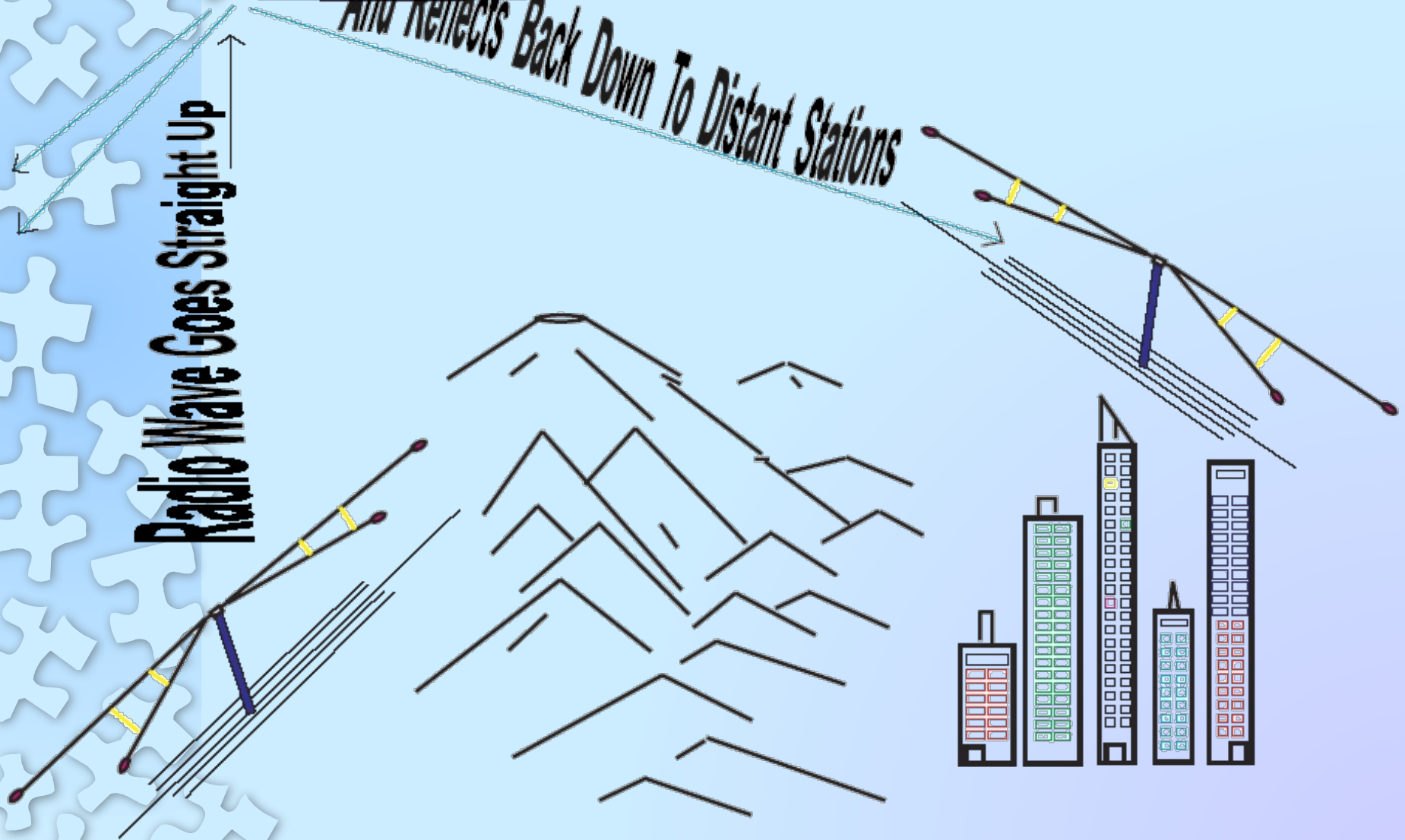


300 Mile Coverage

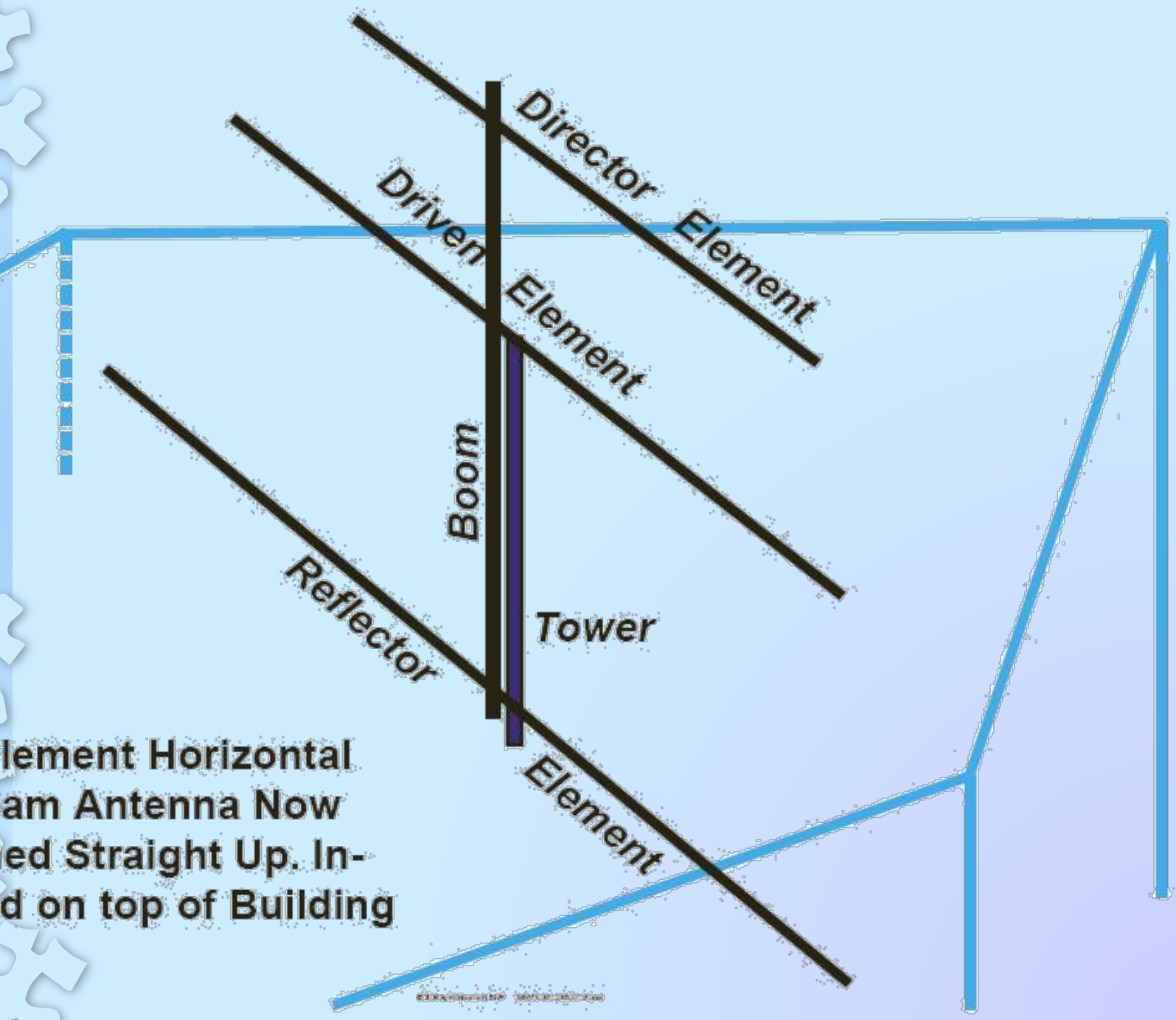
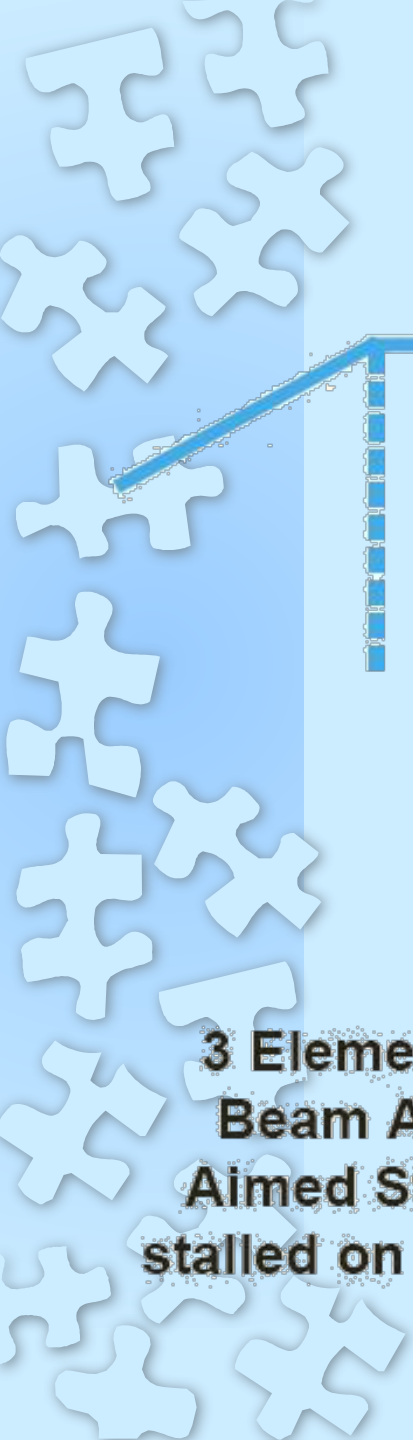


Radio Wave Goes Straight Up

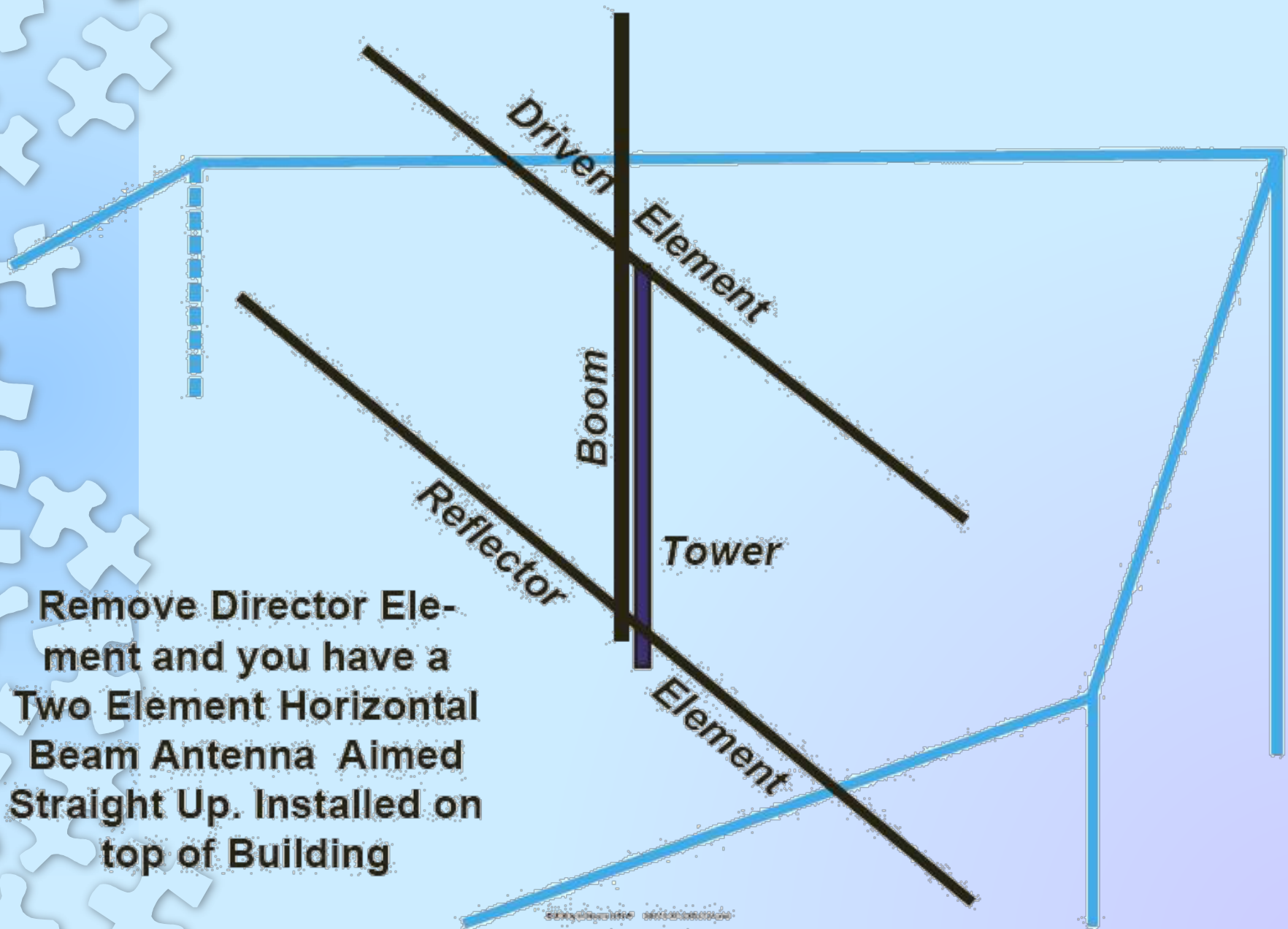
And Reflects Back Down To Distant Stations



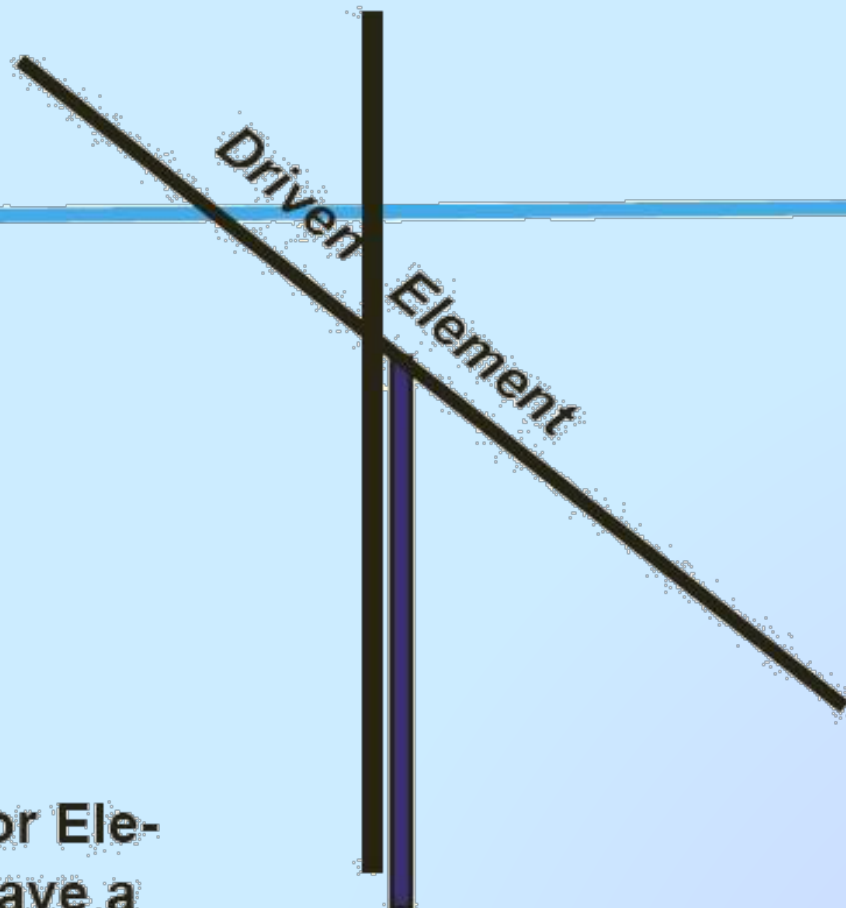
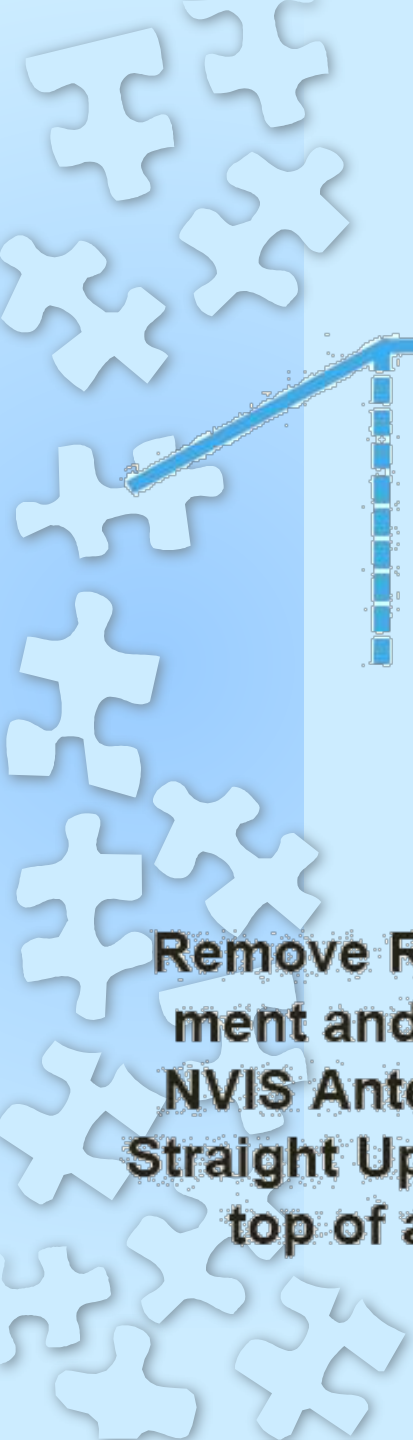




**3 Element Horizontal
Beam Antenna Now
Aimed Straight Up. In-
stalled on top of Building**

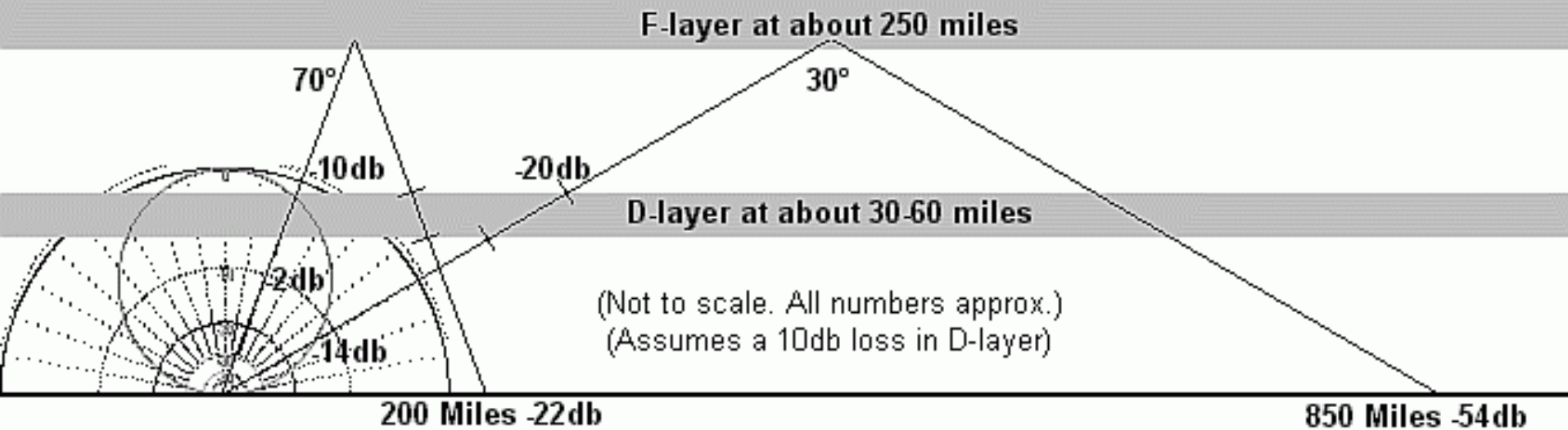


Remove Director Element and you have a Two Element Horizontal Beam Antenna Aimed Straight Up. Installed on top of Building

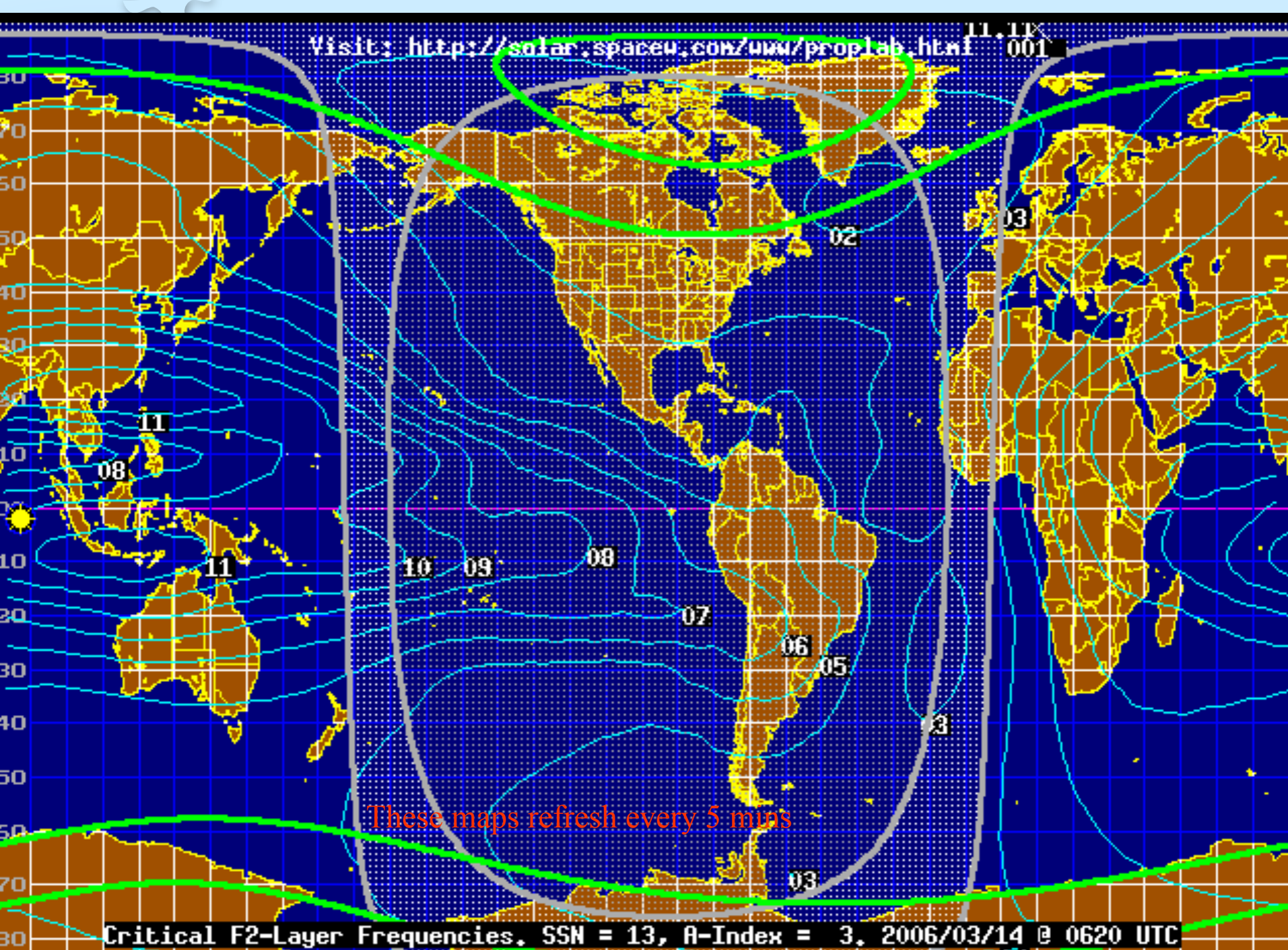


Remove Reflector Element and you have a NVIS Antenna Aimed Straight Up. Installed on top of a Building

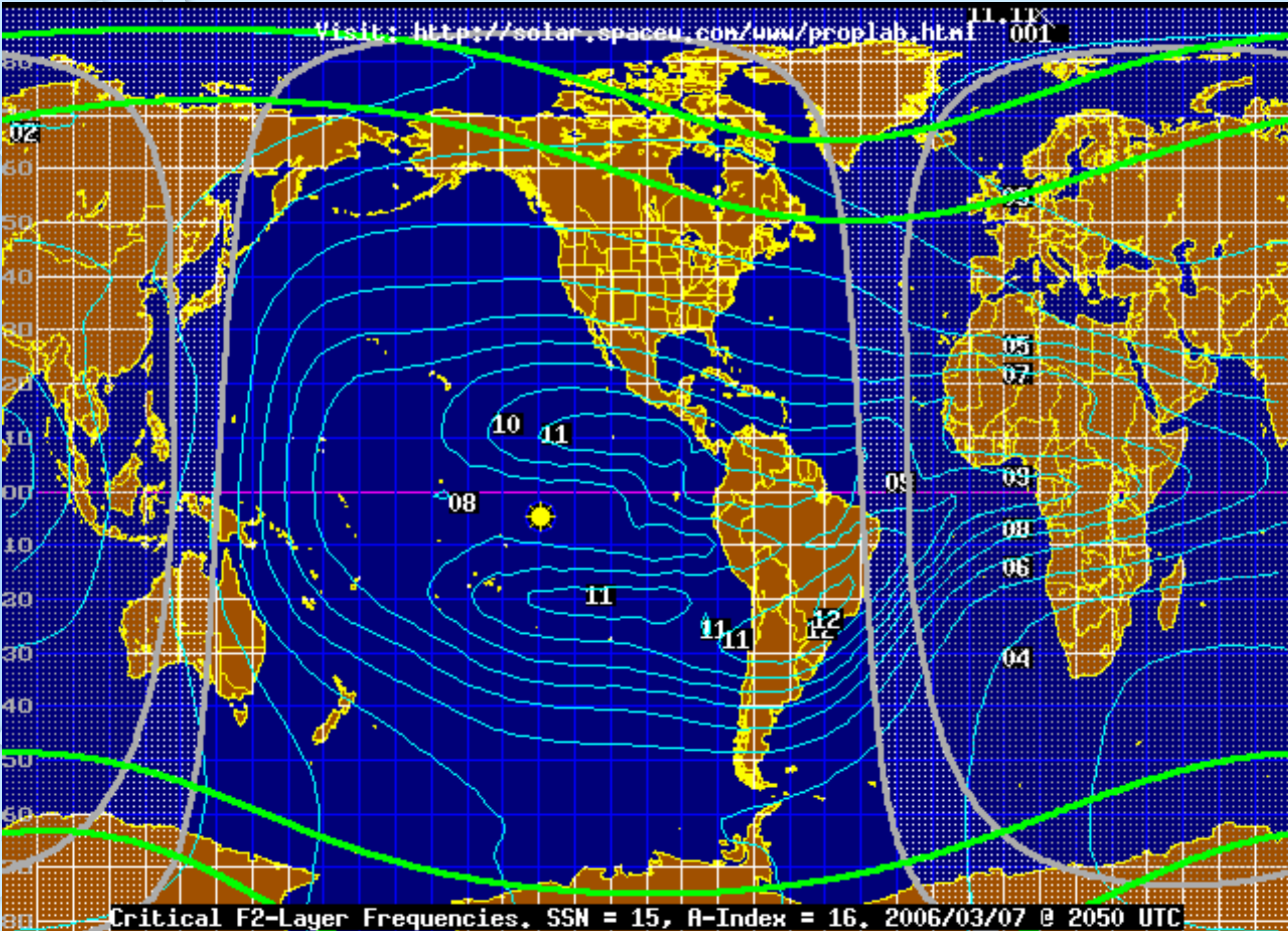
Propagation Considerations



Visit: <http://solar.spaceu.com/www/proplab.html> 11.11X 001

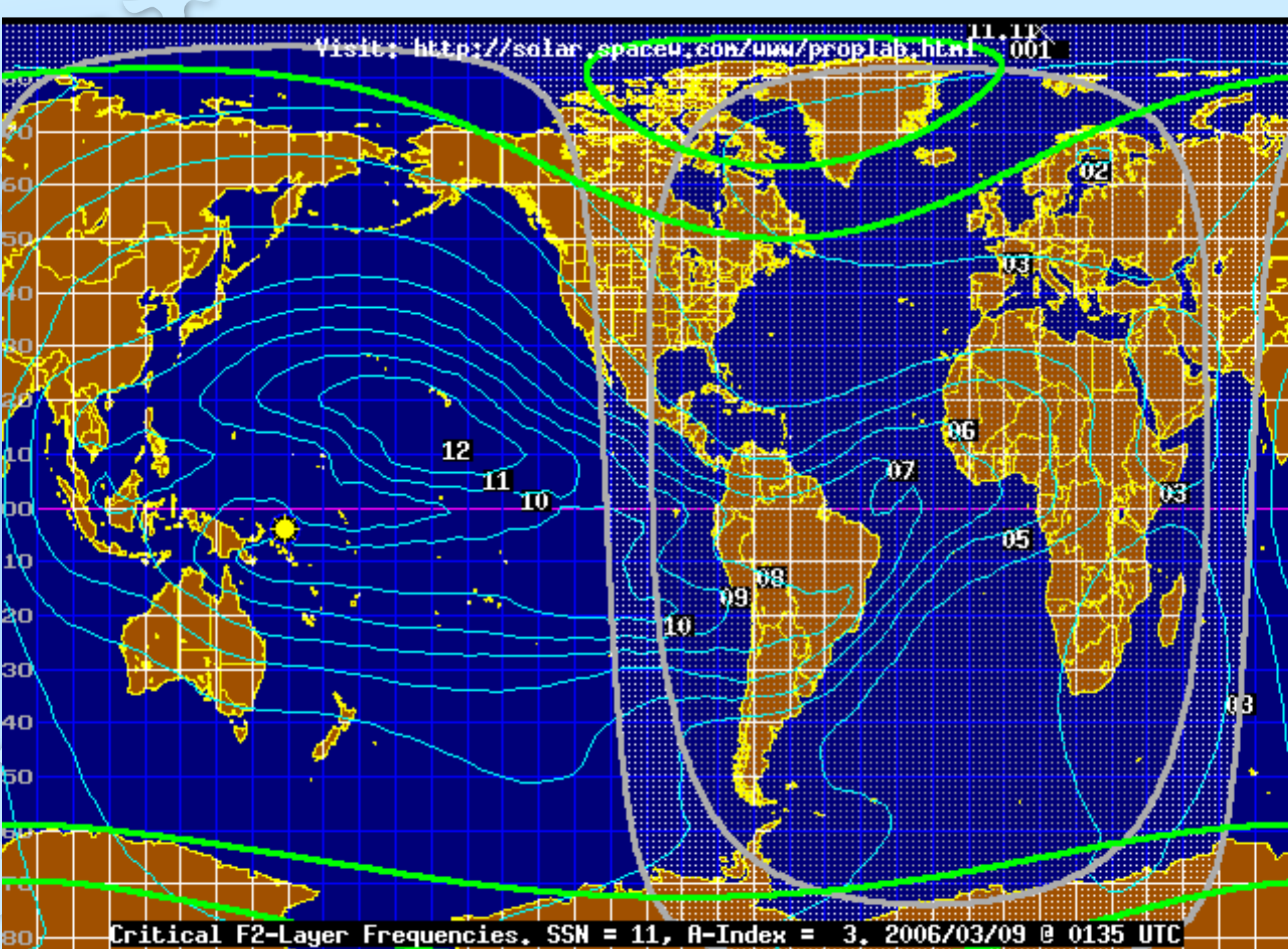


Critical F2-Layer Frequencies. SSN = 13, A-Index = 3. 2006/03/14 @ 0620 UTC



Visit: <http://solar.spaceu.com/www/proplab.html>

11.1K
001



Critical F2-Layer Frequencies. SSN = 11, A-Index = 3, 2006/03/09 @ 0135 UTC

1 ATU

- Equals installation of NVIS antenna

Does this look like your neighborhood?





Can you spot the antenna?

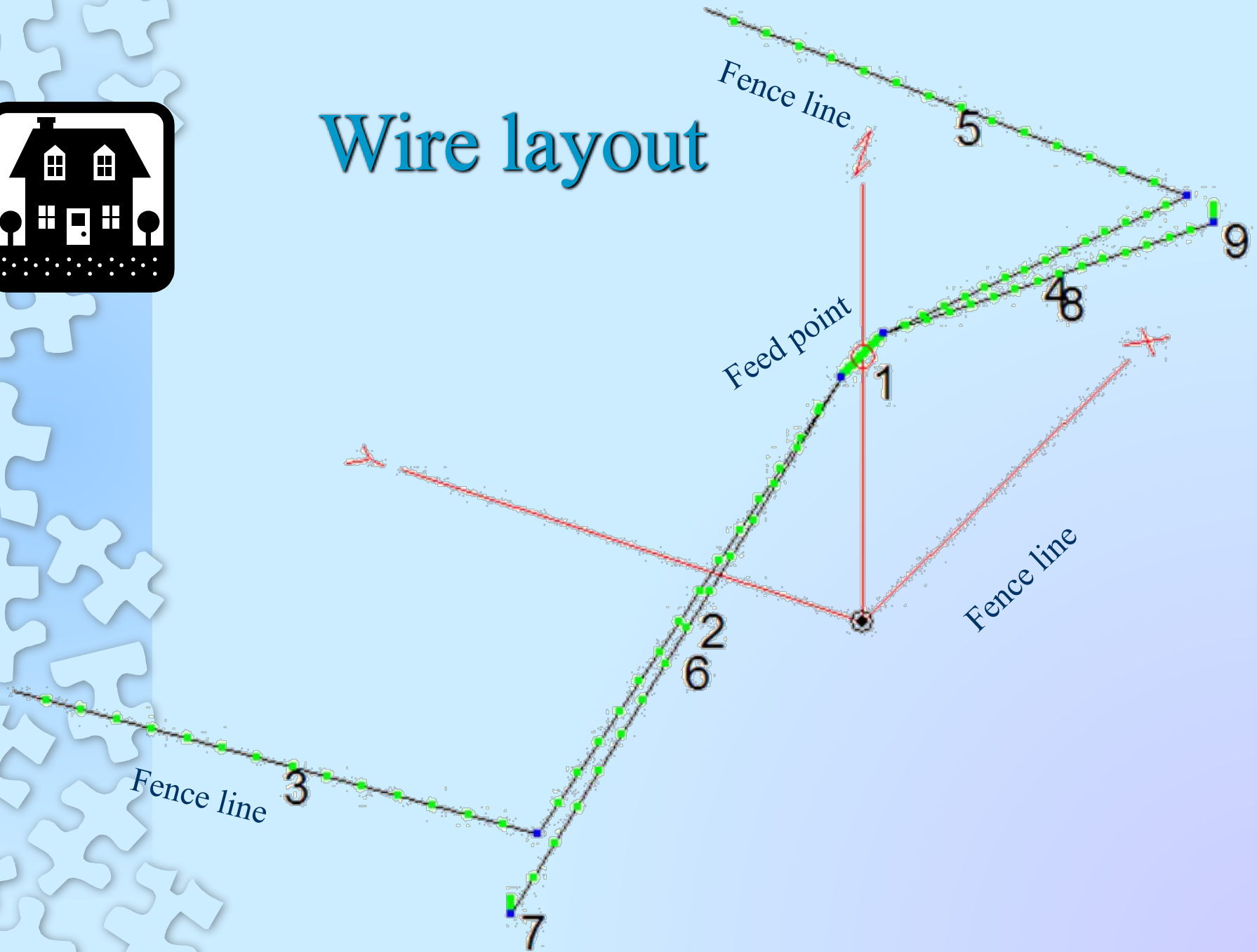


Left side of dual band





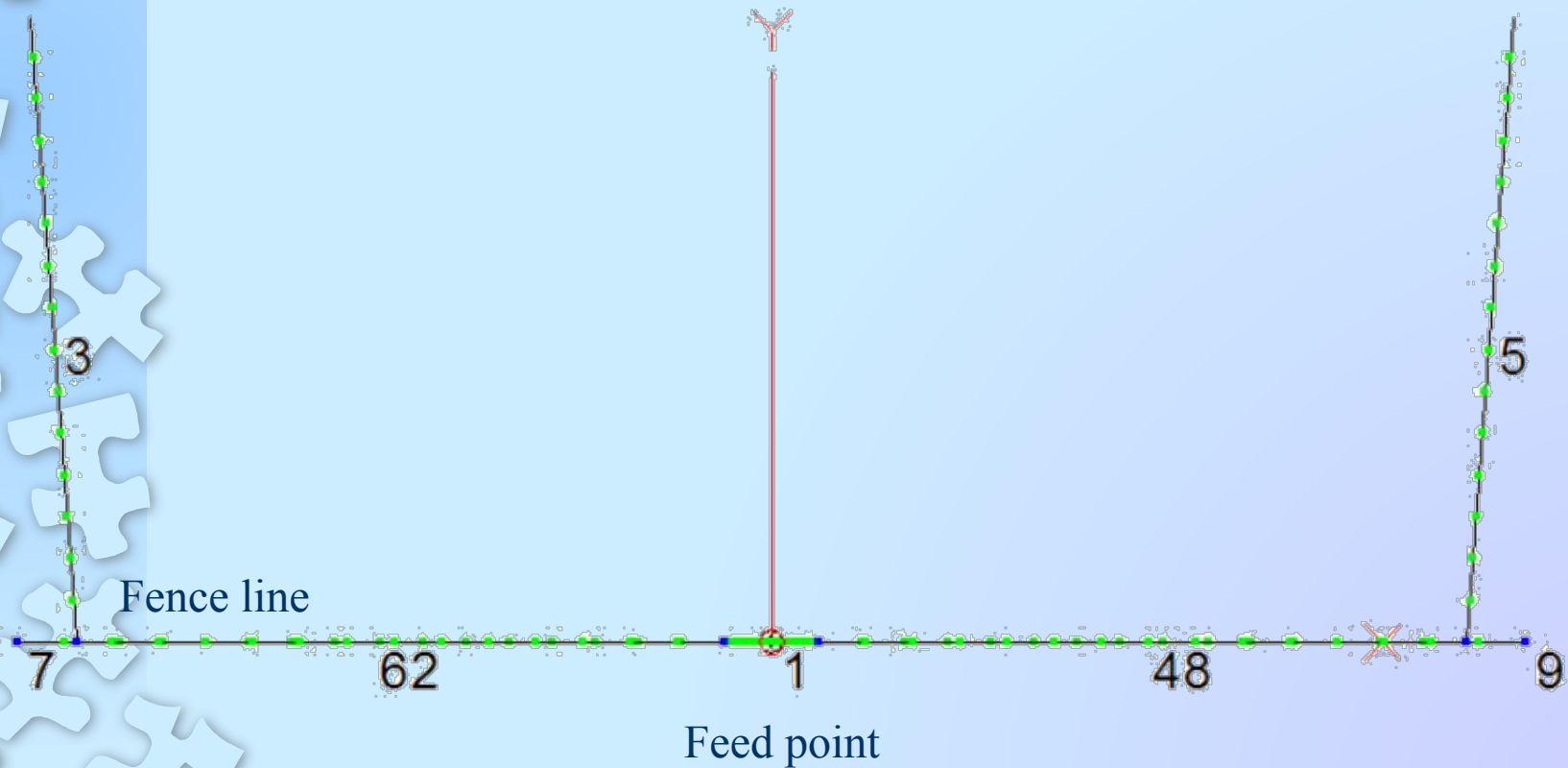
Wire layout



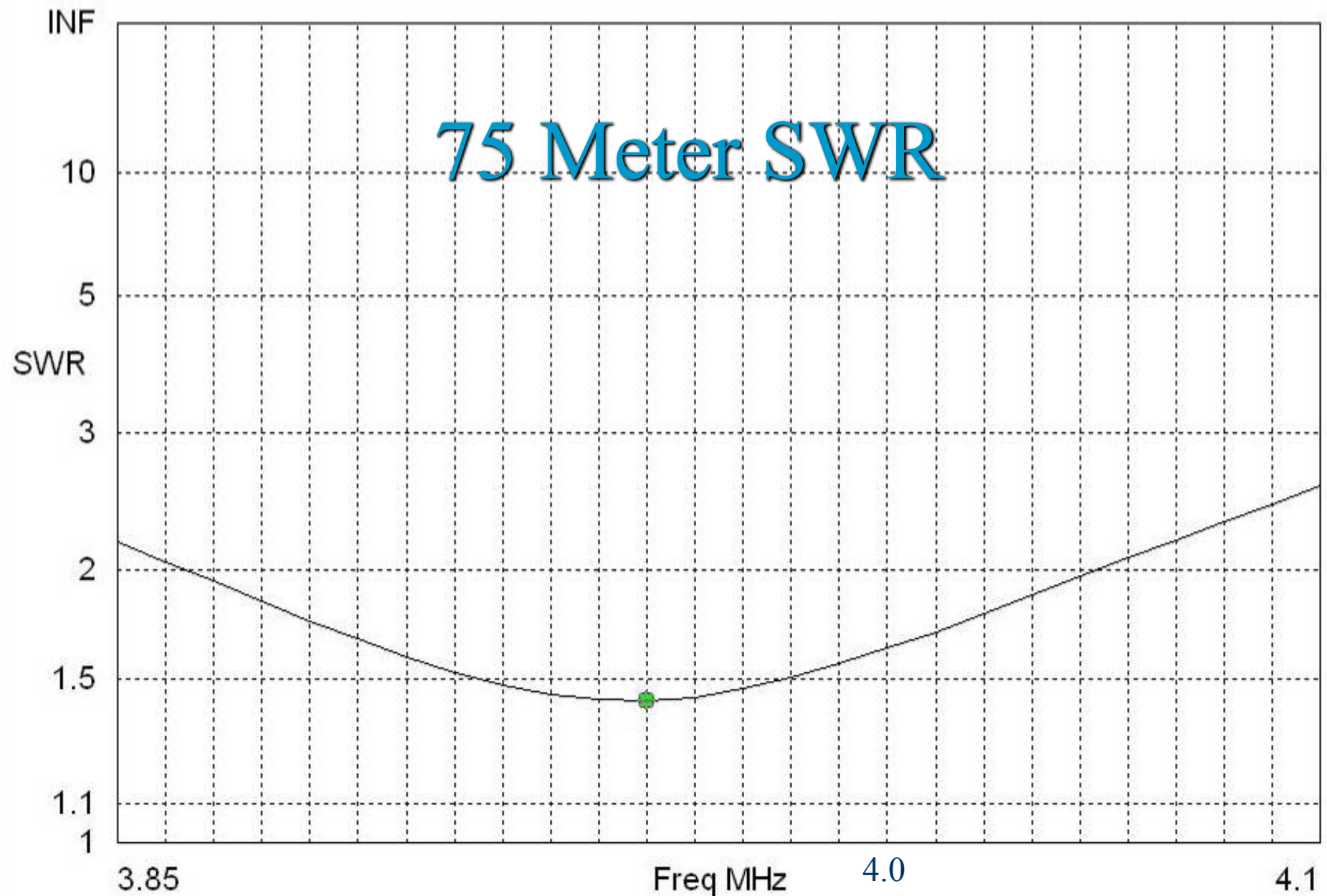


Top down view

EZNEC+



75 Meter SWR



Freq 3.96 MHz
SWR 1.42
Z 35.42 + j 2.23 ohms
Refl Coeff 0.1726 at 169.81 deg.

Source # 1
Z0 50 ohms

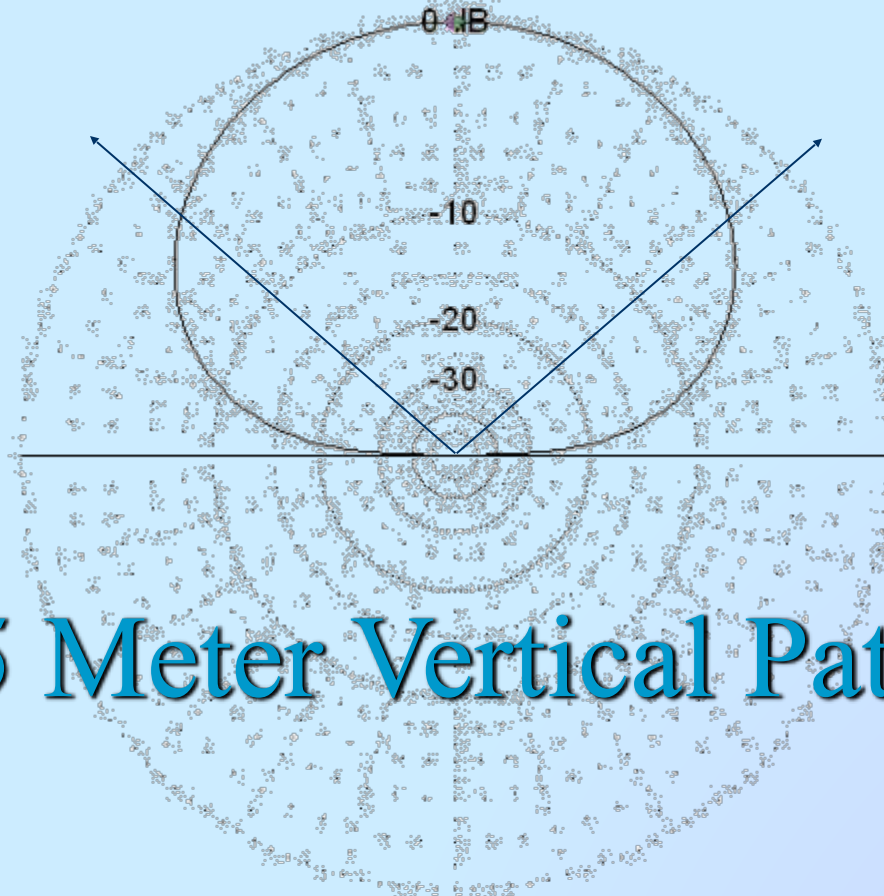


Bandwidth 75 Meters

- 4050 – 2:1
- 3960 – dip
- 3860 – 2:1

* **Total Field**

EZNEC+

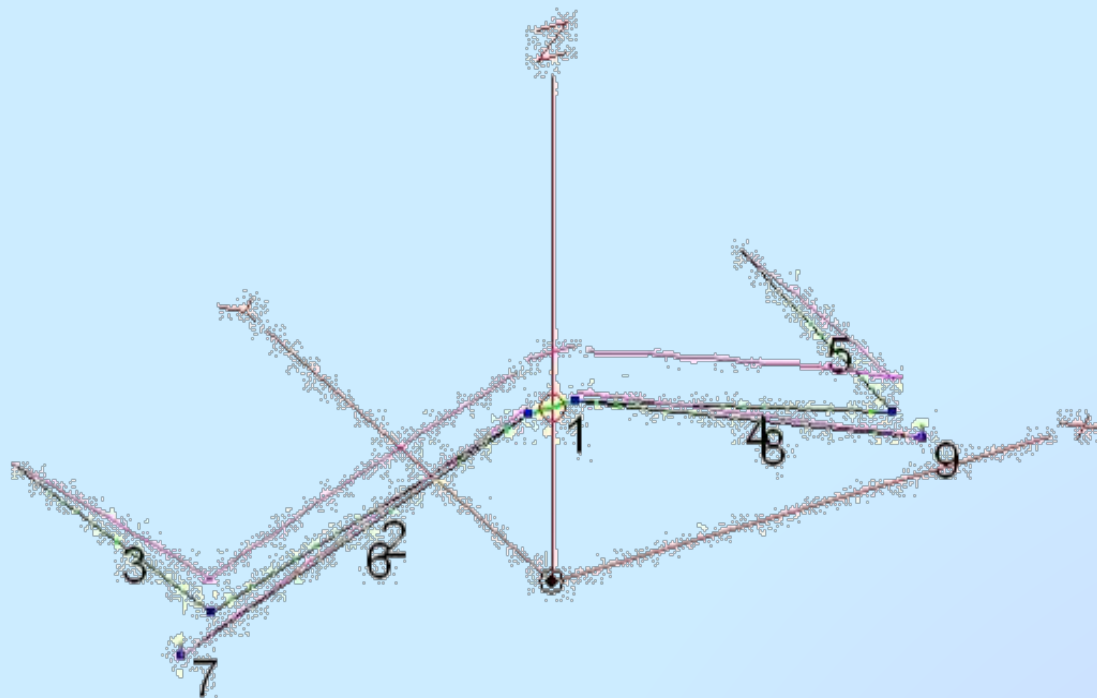


75 Meter Vertical Pattern

3.86 MHz

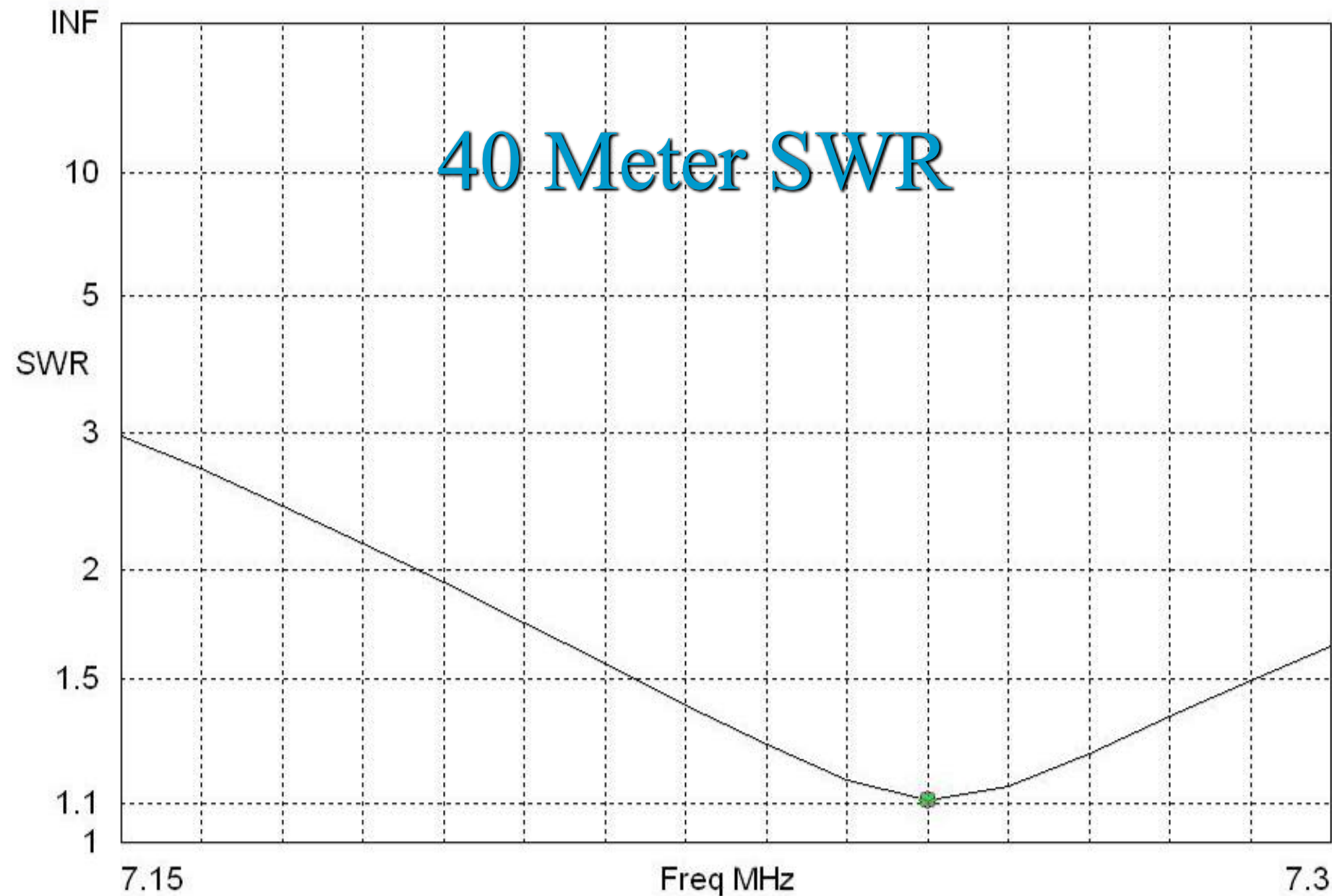
Elevation Plot
Azimuth Angle 90.0 deg
Outer Ring -1.13 dB
Slice Max Gain -1.13 dB @ Elev Angle = 90.0 deg
Beamwidth 97.3 deg, -3dB @ 41.3, 138.6 deg
Sidelobe Gain < -100 dB
Front/Sidelobe > 100 dB

Cursor Elev 90.0 deg
Gain -1.13 dB
0.0 dBmax



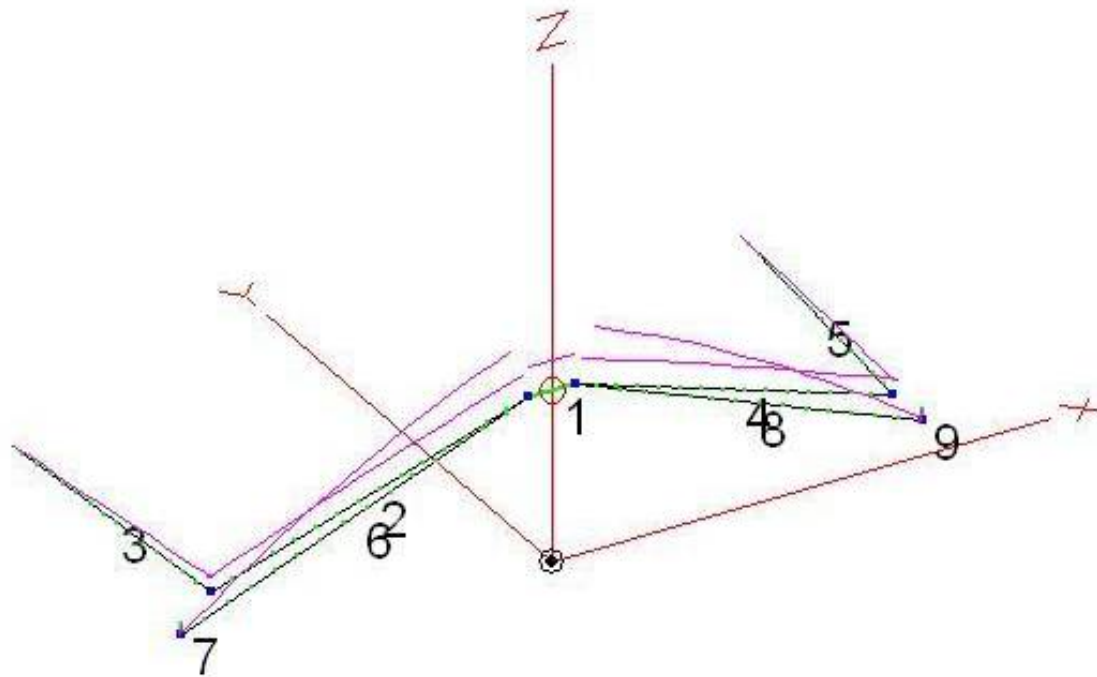
75 Meter Current Flow

40 Meter SWR



Freq 7.25 MHz
SWR 1.11
Z 55.26 - j 0.8609 ohms
Refl Coeff 0.05065 at -8.82 deg.

Source # 1
Z0 50 ohms

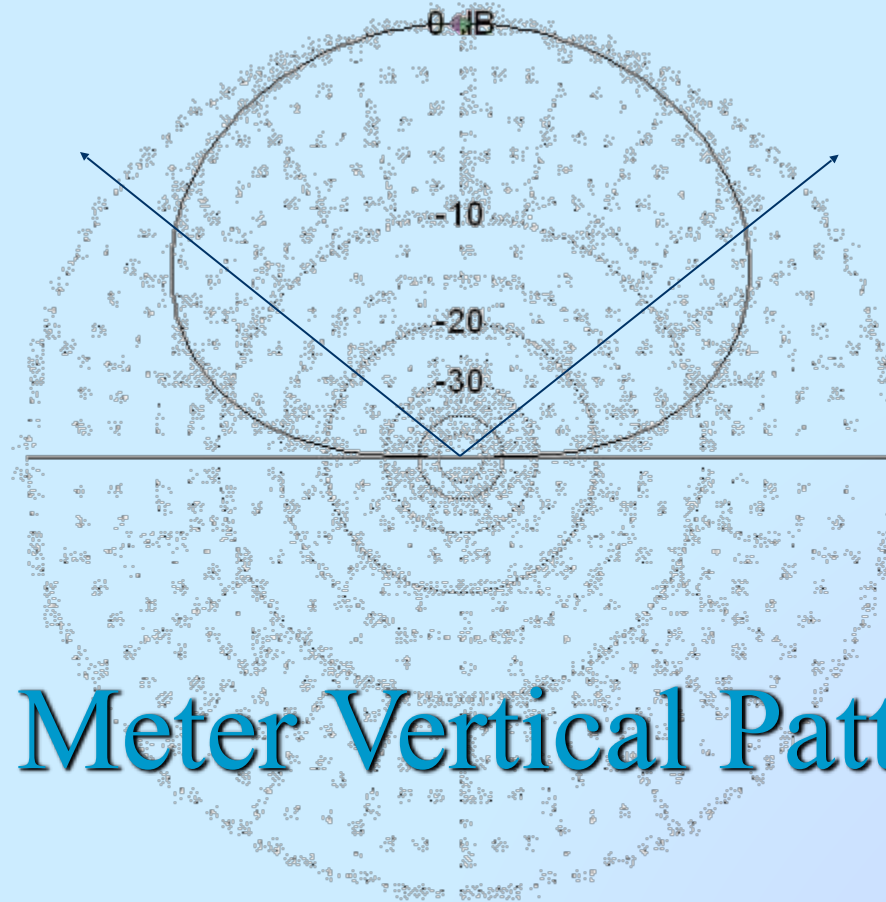


40 Meter Current Flow



Bandwidth 40 Meters

- 7190 – 2:1
- 7250 – dip
- 7370 – 2:1



40 Meter Vertical Pattern

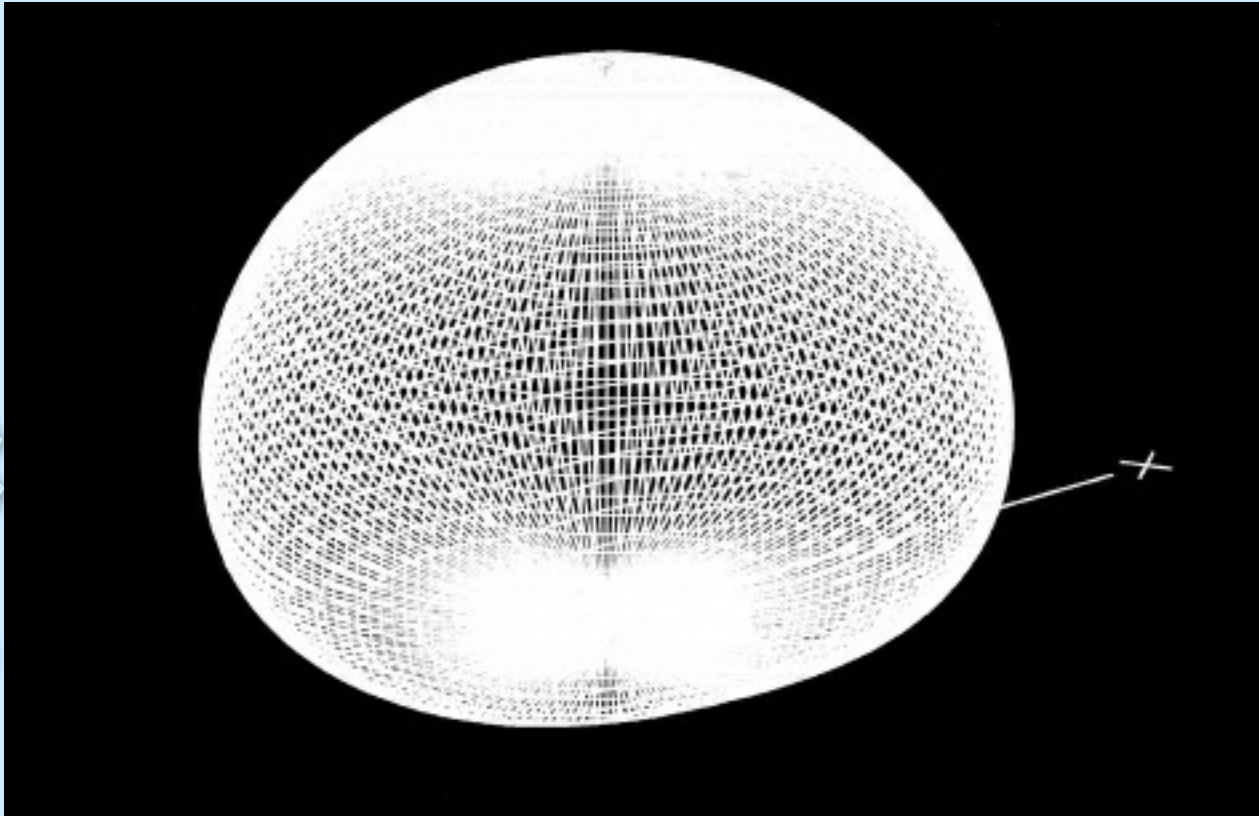
7.22 MHz

Elevation Plot
Azimuth Angle 90.0 deg
Outer Ring 2.72 dBi

Cursor Elev 90.0 deg
Gain 2.72 dBi
0.0 dBmax

Slice Max Gain 2.72 dBi @ Elev Angle = 90.0 deg
Beamwidth 103.1 deg -3dB @ 38.5, 141.6 deg
Sidelobe Gain < -100 dBi
Front/Sidelobe > 100 dB

Omni Pattern



Depth of Current Penetration

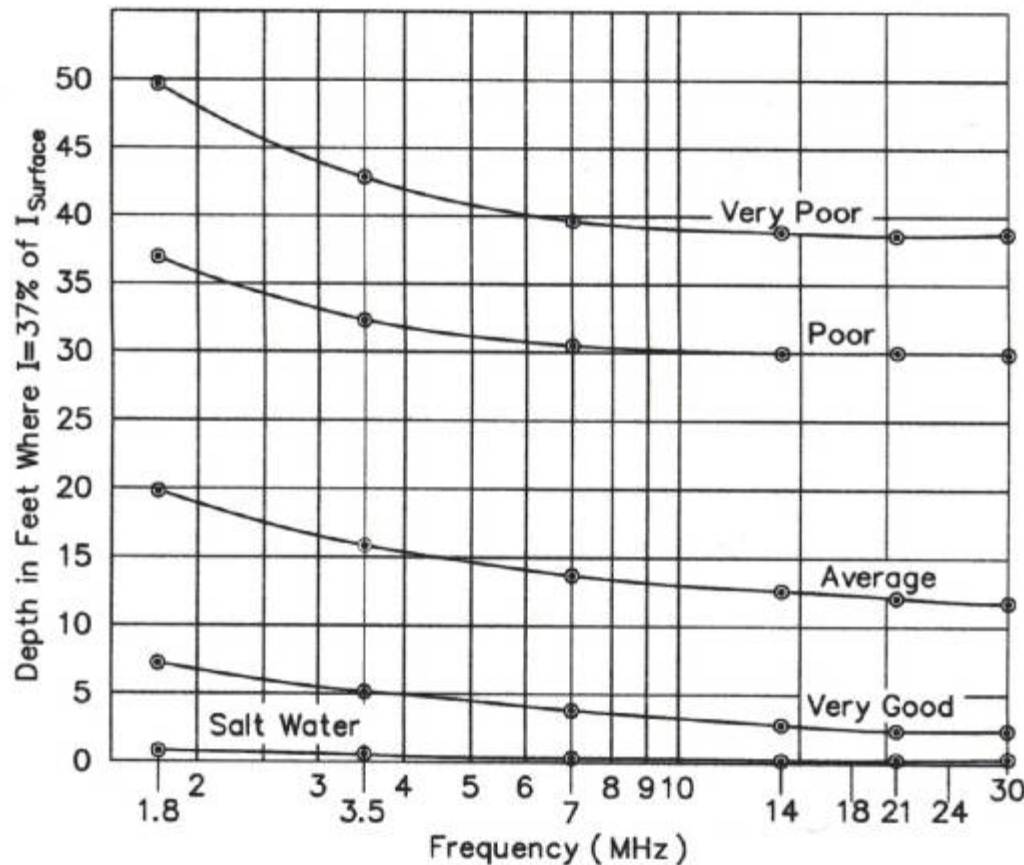


Fig 11—Depths at which the current density is 37% of that at the surface for different qualities of earth over the 1.8- to 30-MHz frequency range. The depth for fresh water, not plotted, is 156 feet and almost independent of frequency below 30 MHz. See text and Table 2 for ground constants.

Feed Point Impedance vs. Height

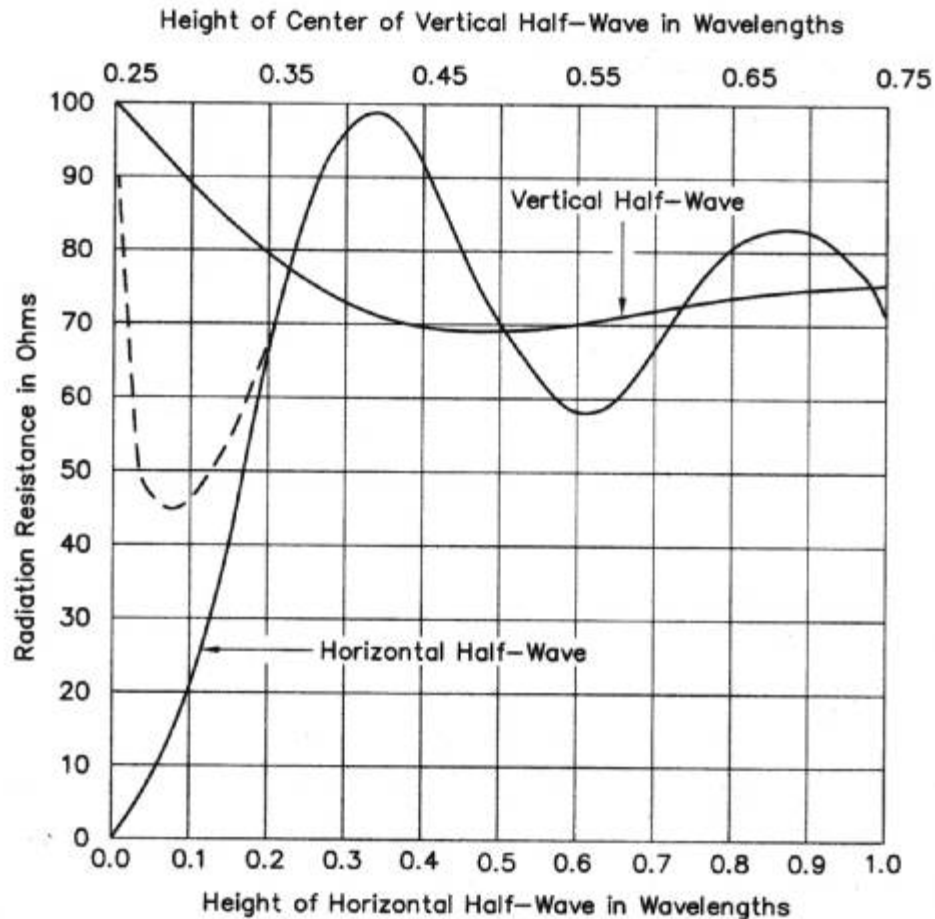


Fig 1—Variation in radiation resistance of vertical and horizontal half-wave antennas at various heights above flat ground. Solid lines are for perfectly conducting ground; the broken line is the radiation resistance of horizontal half-wave antennas at low heights over real ground.



How It Went Together

- Materials
- Construction
- Modifications

Parts List

- 1 Center insulator
- 1 1.5" PVC Slip coupler
- 2 or 3 Hose clamps
- 14 ga. Insulated wire
- 1 10' TV mast
- 1 5' TV mast
- Tie wraps as desired
- 1 Fence stake
- Coax to the shack

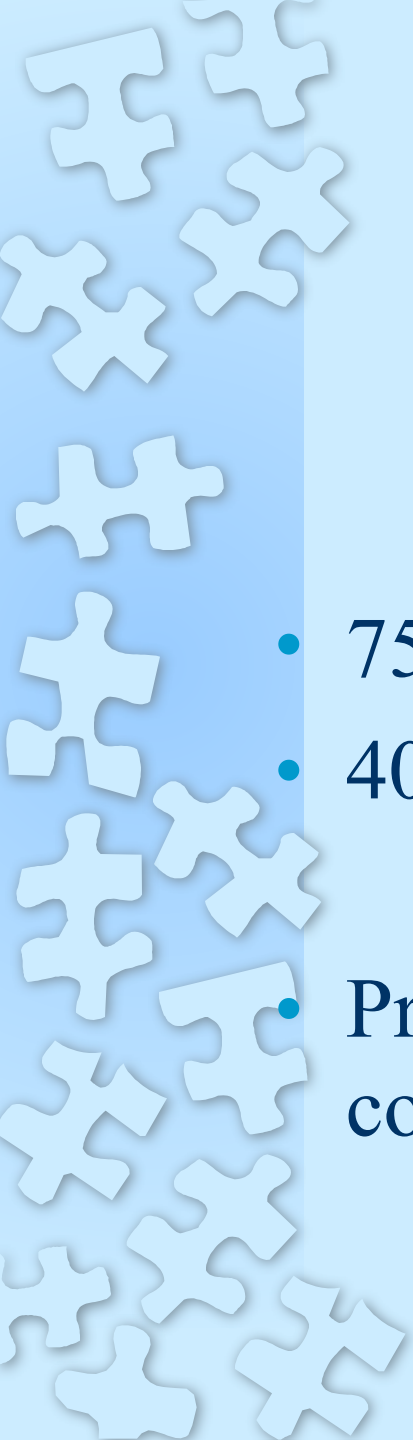




Feed point is at 15'



End of 75M wires are 6' above ground
End of 40M wires are 4' above ground



Element Lengths

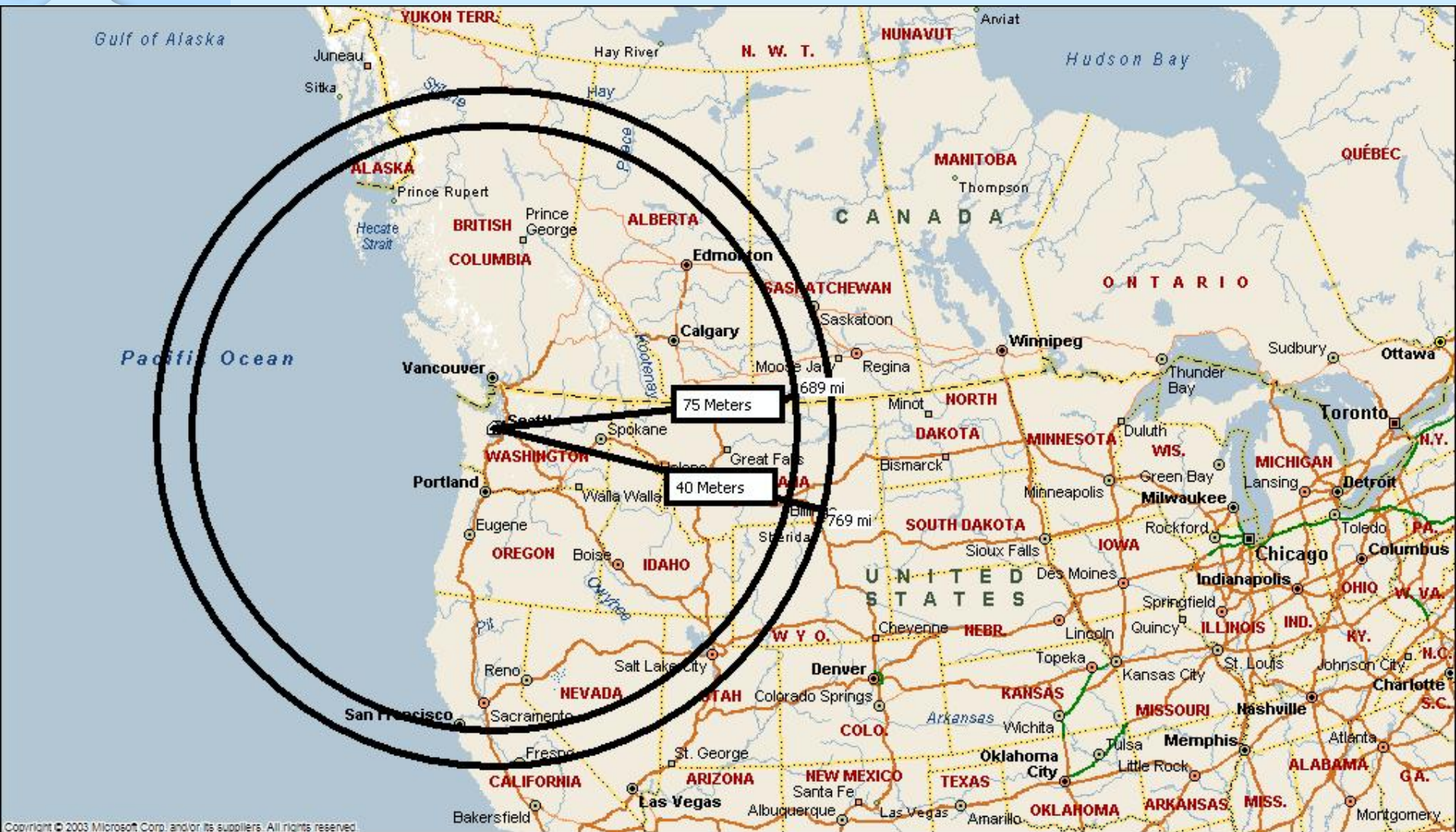
- 75 Mtr legs = 57 ft
- 40 Mtr legs = 39 ft
- Prune these lengths to meet your ground conditions



Beamwidth

- 75 Mtrs 41 deg. To 139 deg.
- 40 Mtrs 39 deg. To 141 deg.

Night Time Ionosphere (300 mi.)





Hints & tips

- Solder wires at the feed point
- Solder feed point pigtail to all other wires
- Coax should be perpendicular to the antenna



Hints & tips (cont.)

- Ground conditions will drive element lengths
- Wet vs.. dry
- Use an antenna analyzer!!!
- Tune 75M first, then 40M
- Minimize the catenaries in the wires but not too tight – the wire will stretch
- Maintain the spacing between the 75 & 40M elements



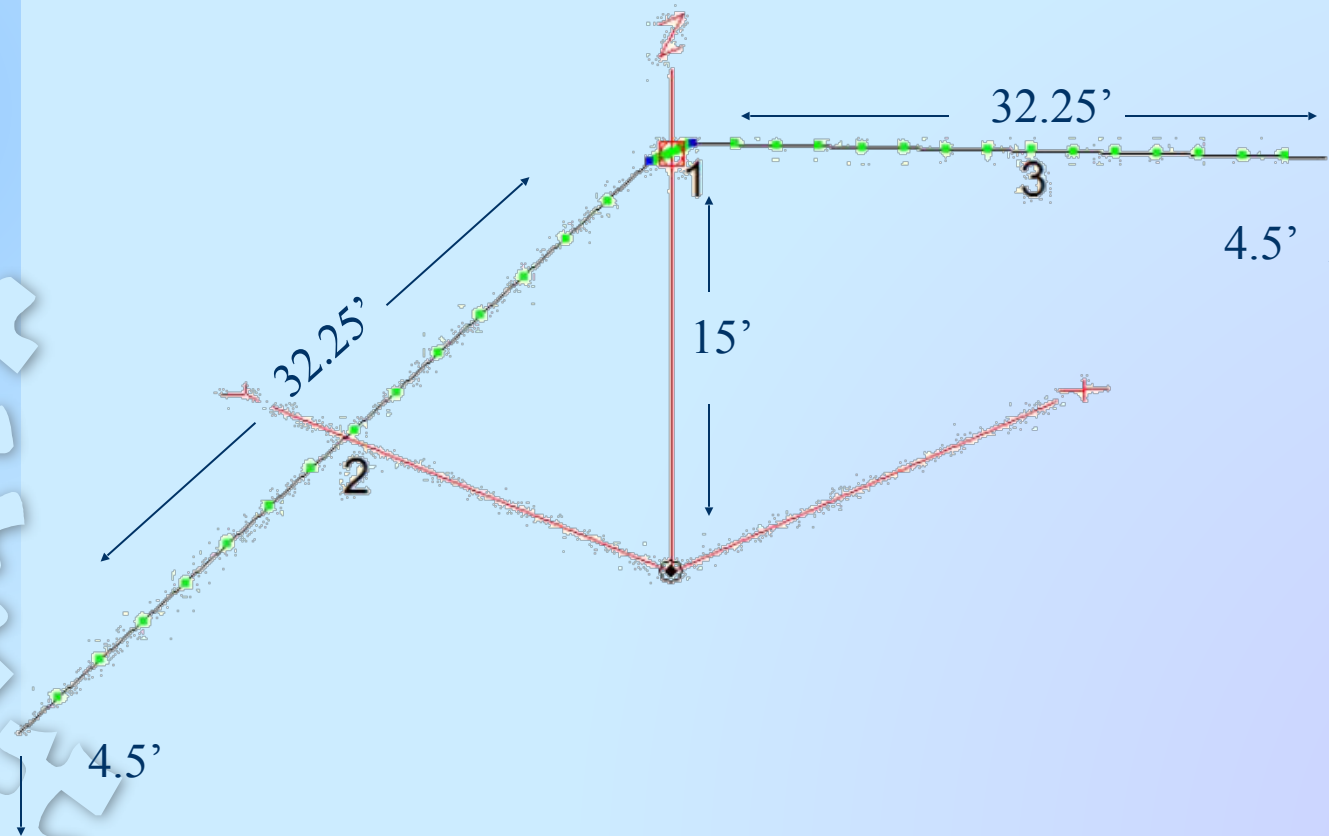


Too big?

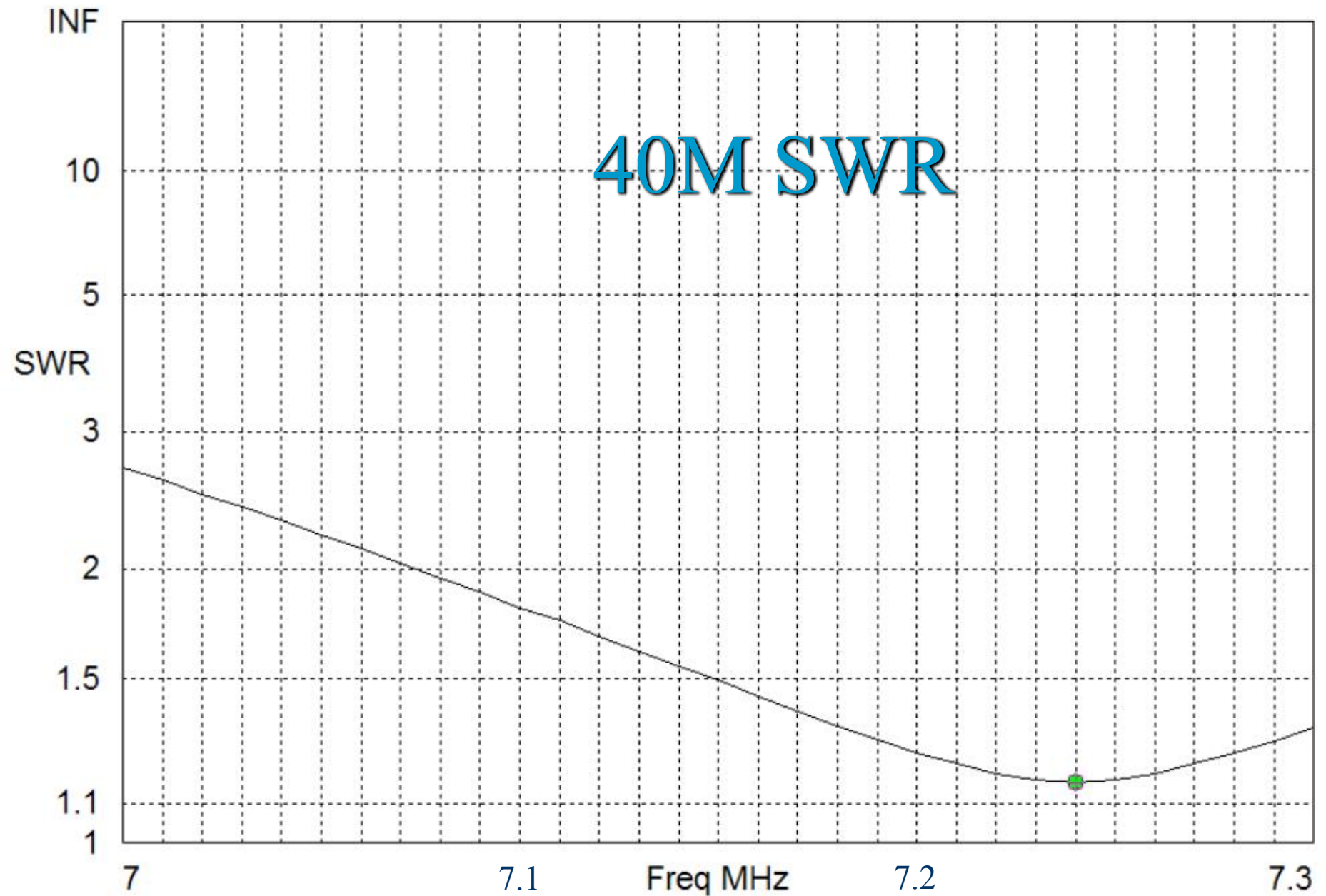
If that doesn't work for you,
try this

40M wire Tunable on 75M

EZNEC+



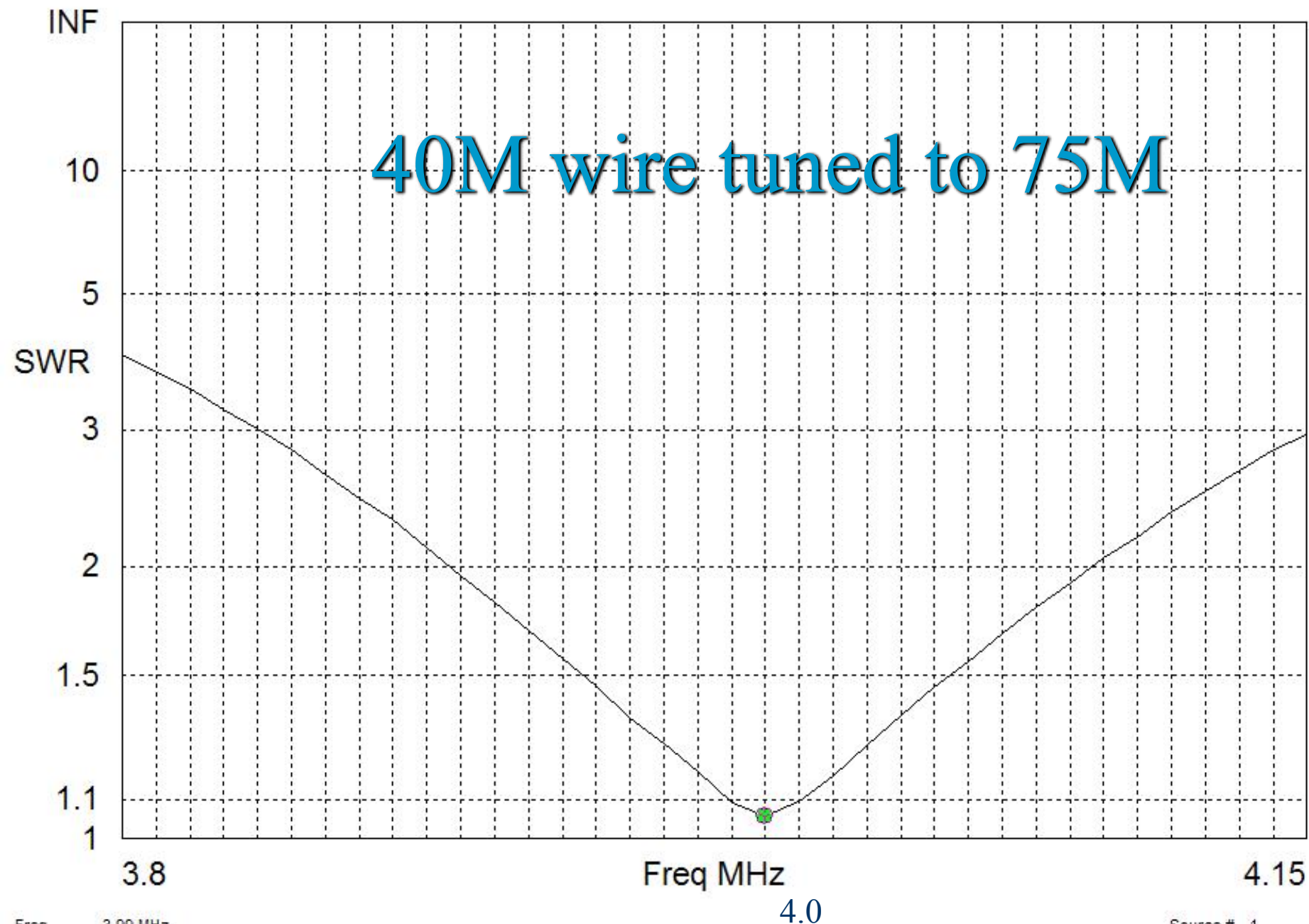
40M SWR



Freq 7.24 MHz
SWR 1.16
Z 57.88 - j0.5715 ohms
Refl Coeff 0.07322 at -3.85 deg.

Source # 1
Z0 50 ohms

40M wire tuned to 75M

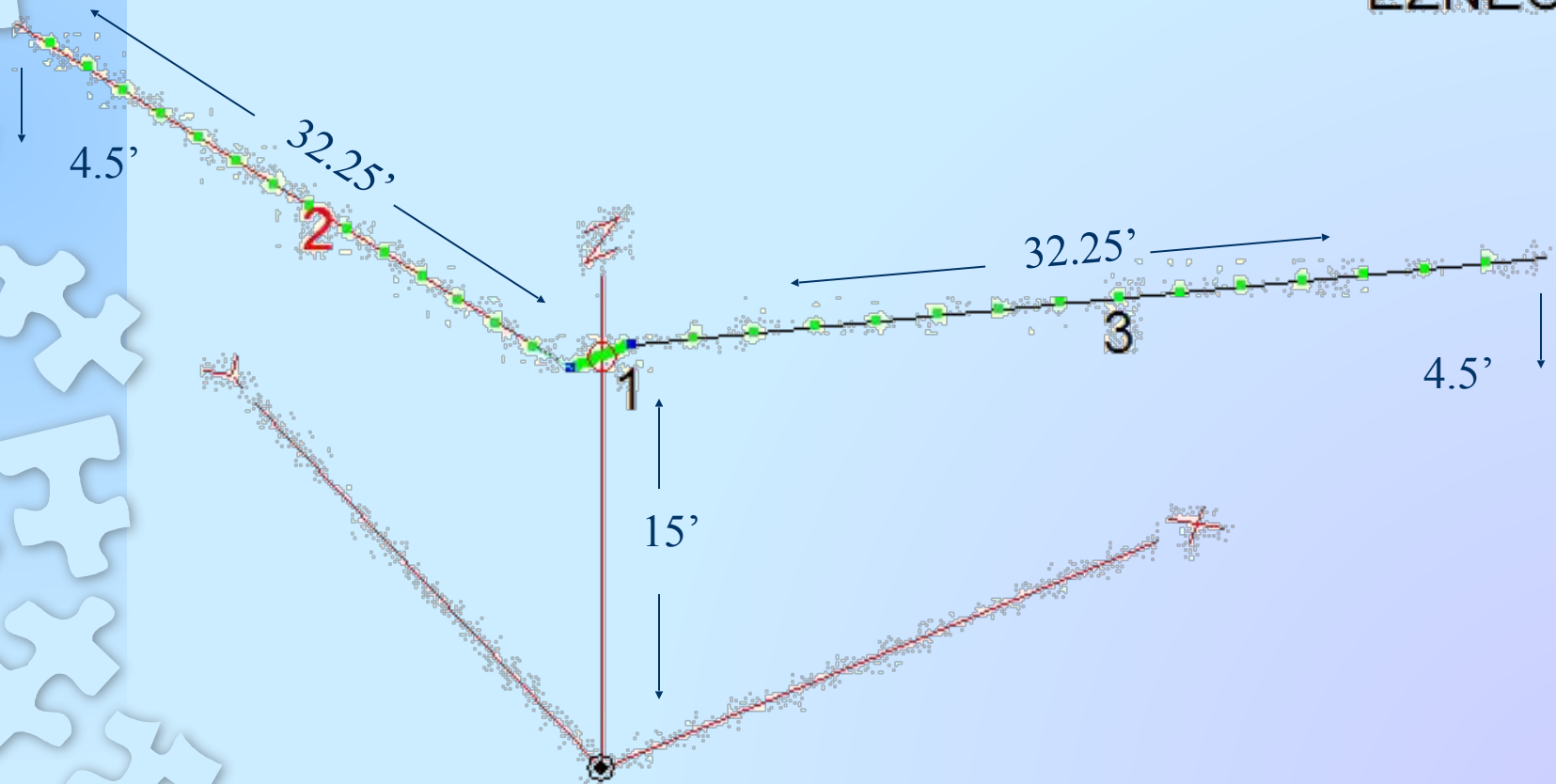


Freq 3.99 MHz
SWR 1.057
Z 47.32 - j 0.2223 ohms
Refl Coeff 0.02764 at -175.13 deg.

Source # 1
Z0 50 ohms

40M wire tunable on 75M in 90 deg. configuration

EZNEC+



Buddipole

Will do 40 thru 2 meters
Although there is an 80M mod



Maximizing the Received Signal

BoKster





Thanks to Bill Balzarini, KL7BB
for all the drawings!



QUESTIONS?

A decorative vertical bar on the left side of the slide, composed of a light blue background with a pattern of white puzzle pieces of various shapes and sizes.

Questions are welcome

- Contact Tom at tjsand@wavecable.com
- Contact Ed at n7nvp@arrl.org



Thank you!

de Ed & Tom